

Effective Date: Fall 2009-2010

Course Description

Prerequisite: Chemistry 1001 or 1201 and Biology 1001, 1201, or 1161. A study of the structure and function of microbial cells with emphasis on their relationship to man. Also reinforces use of scientific process.

Course Objectives

The course seeks to address each area of study outlined in the curriculum guidelines set by the American Society for Microbiology.

1. Differentiate between prokaryotic and eukaryotic organisms.
2. Differentiate among the different classes of microorganisms.
3. Become familiar with the roles that microorganisms play on this planet.
4. Understand the role of microorganisms in human health and disease.
5. Become familiar with mechanisms for prevention from and treatment of microbial diseases.
6. Develop personal laboratory technique for handling and identifying microorganisms.

Procedures to Evaluate these Objectives

1. Written examinations will be given to determine student understanding of the lecture material. These examinations will include both objective and subjective questions.
2. Written examinations will also be used to evaluate student understanding of the material covered in the laboratory. Questions will cover the purpose for the laboratory experiments covered, how the procedures were performed, and the interpretation of the experimental results.
3. Students will be required to demonstrate their understanding of laboratory technique and experimental results by identifying an unknown bacterium.
4. Other evaluation methods may include: student-prepared slide collections of microbial staining techniques, student laboratory notebooks outlining the hypothesis, procedure, results and conclusion for each experiment, and submission of examples of current news items related to topics covered in class.

Use of Results of Evaluation to Improve the Course

1. If examination of students indicate a consistent negative trend in meeting any of the stated course objectives, the course lecture material and/ or representative organisms will be examined and adjusted to improve student comprehension of the material.

2. If students are failing to grasp concepts presented in laboratory, different experiments may be substituted to teach the concept in a different way.
3. If a majority of students are unable to correctly identify an unknown organism to the correct genus, additional information pertaining to the correct interpretation of results and how to use a logical, step-wise approach to a problem may be employed.

Detailed Topical Outline

1. Introduction to microbial organisms
 - a. General characteristics of each type of microbe
 - b. General roles of each type of microbe in the ecosystem
2. Structural differences between prokaryotic and eukaryotic cells
3. Cellular metabolism (with an emphasis on microbial variations)
 - a. Principles of metabolism
 - b. Enzymes
 - c. Central metabolic pathways: glycolysis, Krebs, pentose-phosphate, oxidative phosphorylation
 - d. Auxiliary pathways: fermentation
 - e. Catabolism of organic compounds other than carbohydrates
 - f. Photosynthesis
 - g. Anabolic pathways
4. Microbial Genetics
 - a. Replication
 - b. Gene expression (transcription and translation)
 - c. Gene regulation
 - d. Mechanisms of gene transfer
 - e. Mutations and mutagens
5. Classification of microbes
 - a. Characteristic of microbes
 - i. Protozoans
 - ii. Helminthes
 - iii. Fungi
 - iv. Algae
 - v. Other microbes (viruses, viroids and prions)
 - b. Roles of microbes in the ecosystem
6. Principles of disease and epidemiology
 - a. Sources of disease and transmission to the host
 - b. Spread of infection throughout a community
 - c. Mechanisms for prevention of disease transmission
 - d. Stages of disease progression
7. Microbial mechanisms of pathogenicity
 - a. Circumvention of host resistance and immunity
 - b. Drug resistance

8. The innate immune response
 - a. Physical and chemical barriers to infection
 - b. Cell types of the innate response
 - c. Inflammation
 - d. Fever
 - e. Complement mediated responses
9. The adaptive immune response
 - a. The lymphatic system and associated cells
 - b. The nature of antigens and antibodies
 - c. B cells and the antibody response
 - d. T cells and cell-mediated immunity
10. Microbial Ecology
 - a. Aquatic habitats
 - b. Terrestrial habitats
 - c. Mutualistic relationships of prokaryotes and eukaryotes

Detailed Topical Outline for the Laboratory

1. Laboratory safety
2. Proper techniques for the culture and use of microbes
3. Environmental influences on microbial growth
4. Microbial staining and microscopic techniques
5. Identification of unknown bacteria
6. Bacterial mutagenicity
7. Effects of antimicrobial agents
8. Examination of water-borne bacteria
9. Medical Microbiology